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(54) Glands for terminating cables and pipes.

(57) An insulation piercing earthing ring 16 for a gland termination to provide earth continuity between an electrically conductive gland body 6 and an electrically conductive inner sleeve 2 of an insulated cable or pipe 1 comprises a flat annular washer 17 for locating against the end of the cable or pipe 1 with at least one contact finger 18 extending from the periphery of the washer 17 to surround the cable or pipe 1 and terminating in an inwardly directed projection 19 for piercing the insulation 4. The contact finger 18 extends axially and radially outwards from the periphery of the washer 17 in the undeformed free state and is/are deformed radially inwards by engagement with a tapered entry portion 11 of the gland body 6 causing the projection 19 to pierce the insulation 4 and contact the electrically conductive inner sleeve 2.

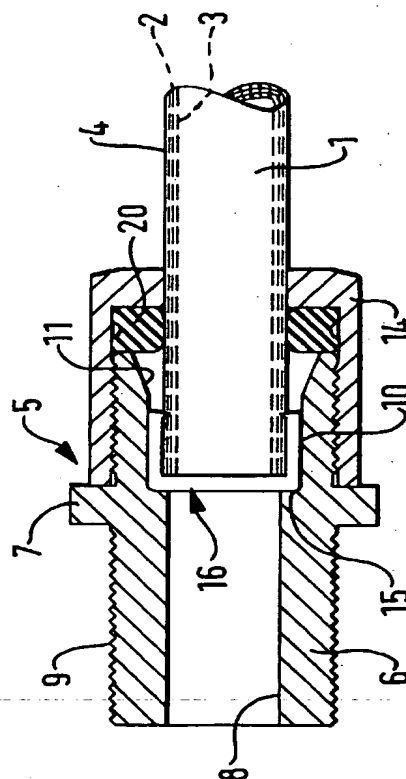


FIG.1

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This invention relates to glands for terminating cables and pipes.

The invention has particular application to terminations where good earth continuity is required between electrically conductive parts of the gland and the cable or pipe.

Typically the cable or pipe has an electrically conductive sleeve covered by an outer sheath of electrically insulating material that is received in an electrically conductive body of the gland. Currently, it is the practice to remove the outer insulation to expose the sleeve and to provide an earthing ring in the gland body for making electrical contact between the exposed sleeve and the gland body.

It is an object of the present invention to provide a gland for terminating cables and pipes having an outer sheath of electrically insulating material which provides earth continuity between electrically conductive parts of the gland and the cable or pipe without removing the outer sheath.

According to one aspect of the invention a gland for terminating cables and pipes having an electrically conductive sleeve covered by an outer sheath of electrically insulating material comprises an electrically conductive gland body to receive the cable or pipe, and an earthing ring adapted to pierce the outer sheath within the gland body and contact the sleeve to provide earth continuity between the sleeve and the gland body.

By arranging for the earthing ring to pierce the outer sheath, earth continuity between electrically conductive parts of the gland and cable or pipe is ensured without removing the outer sheath.

Preferably, the earthing ring has at least one contact finger that extends axially and radially outwards in the undeformed free state and is compressed by engagement with the gland body during assembly to pierce the outer sheath.

Advantageously, the or each contact finger terminates in an inwardly directed projection such as a spike for piercing the outer sheath and contacting the electrically conductive sleeve of the cable or pipe.

Preferably, the gland body has a tapered entry portion for compressing the or each contact finger on insertion of the earthing ring.

Advantageously, the earthing ring comprises a flat washer engaged by the end of the cable or pipe with the contact finger(s) extending from the periphery of said washer.

Preferably, the gland includes means for sealing the outer sheath of the cable or pipe. The sealing means may comprise an annular seal of rubber or like resilient material that is compressed inwardly to engage the outer sheath by threaded engagement of a seal nut with the entry body.

Advantageously, the entry body has a stop that is engaged by the seal nut to control compression of the seal.

According to another aspect of the invention a gland for terminating cables and pipes having an electrically conductive sleeve covered by an outer sheath of electrically insulating material comprises an electrically conductive gland body having an axial opening at one end for receiving the cable or pipe, and an electrically conductive earthing ring receivable in the opening for providing an earth connection between the gland body and the cable or pipe, the earthing ring being a push fit in the opening on insertion of the cable or pipe and having at least one contact finger for surrounding the outer sheath of the cable or pipe with an inwardly directed projection for piercing the outer sheath and contacting the sleeve, the contact finger being arranged to extend axially and radially outwards in an undeformed free state of the earthing ring prior to insertion in the opening and being deflectable inwardly towards the cable or pipe on insertion of the earthing ring into the opening by engagement with a tapered entry portion of the opening causing the projection to pierce the outer sheath and contact the sleeve.

Other features, benefits and advantages of the invention will be apparent from the following description described of exemplary embodiments with reference to the accompanying drawings, wherein:-

FIGURE 1 is a longitudinal sectional view of an assembled termination employing a gland according to a first embodiment of the present invention;

FIGURE 2 is an exploded longitudinal sectional view of the termination of Figure 1 prior to assembly;

FIGURE 3 is an exploded isometric view of the component parts of the gland shown in Figures 1 and 2; and

FIGURE 4 is a longitudinal sectional view of an assembled termination employing a gland according to a second embodiment of the present invention.

With reference to Figures 1 to 3 of the accompanying drawings, a composite pipe 1 for one or more conductors (not shown) such as electric cable or fibre optic cable comprises an electrically conductive sleeve 2 sandwiched between inner and outer electrically insulating sheaths 3 and 4 respectively.

In this exemplary embodiment the sleeve 2 is an aluminium tube and the sheaths 3,4 are made of non-conducting plastics having appropriate properties for the intended application.

An earth continuity termination for the pipe 1 is provided by a gland 5 having an electrically conductive entry body 6 formed with an external hexagonal flange 7 for engagement by a spanner or like tool to rotate the entry body 6.

One end of the body 6 has a cylindrical bore 8 and an external thread 9 for securing the entry body 6 to an enclosure such as a junction box or other electrical

equipment (not shown) to which the conductor(s) extending through the pipe 1 are connected in known manner.

The other end of the body 6 has a coaxial counterbore 10 with a tapered portion 11 of frusto-conical shape at the outer end and an external thread 12 for threaded engagement with a complementary internal thread 13 of a seal nut 14.

The counterbore 10 terminates at the inner end in an internal shoulder 15 providing a seating for an electrically conductive earthing ring 16.

The ring 16 comprises a flat annular washer 17 sized to fit within the counterbore 10 and provided with a plurality of circumferentially spaced deflectable cantilever contact fingers 18. The contact fingers 18 extend axially and radially outwards from the periphery of the washer 17 in the undeformed free state of the ring 16 and terminate in radially inwardly directed spikes 19.

On assembly, the seal nut 14 and a resilient annular seal 20 of U-shape in axial section are slipped over the end of the pipe 1. The earthing ring 16 is then positioned with the washer 17 seated against the end of the pipe 1 to axially locate the earthing ring 16 and the contact fingers 18 surrounding and spaced from the outer sheath 4. The end of the pipe 1 and earthing ring 16 are then pushed into the counterbore 10 of the entry body 6 until the washer 17 locates against the shoulder 15.

As the pipe 1 and ring 16 are pushed into the counterbore 10, the contact fingers 18 are compressed radially inwards by engagement with frusto-conical entry portion 11 causing the spikes 19 to pierce the outer sheath 4 and contact the sleeve 2. The pipe 1 and deformed fingers 18 are a close fit in the counterbore 10 when pushed fully home thereby ensuring good earth continuity between the sleeve 2 and entry body 6 through the ring 16.

Finally, the termination is completed by bringing the seal nut 14 into threaded engagement with the entry body 6. As the seal nut 14 is tightened on the entry body 6, the seal 20 is compressed onto the outer sheath 4 of the pipe 1 to provide a fluid-tight seal and strong grip to prevent the pipe 1 being pulled out of the entry body 6. A constant compression of the seal 20 is obtained by tightening the seal nut 14 against the flange 7 of the entry body 6.

Figure 4 shows a second embodiment in which like reference numerals are used to indicate parts corresponding to the first embodiment above-described. In this embodiment, an O-ring 20 is compressed by engagement with the frusto-conical entry portion 11 on tightening the seal nut 14 to provide a fluid-tight seal and strong grip to prevent the pipe 1 being pulled out of the entry body 6.

As will be appreciated from the foregoing description, the earthing ring 16 ensures that good earth continuity is obtained between the sleeve 2 and entry

body 6 on assembly without removing the outer insulation sheath 4 of the pipe 1. Furthermore, by arranging the earthing ring to be a push fit on inserting the cable or pipe 1 with contact fingers 18 that are deflected to pierce the outer insulation sheath 4 of the cable or pipe 1, the required earth continuity is achieved independently of and does not rely on threaded engagement of the seal nut 14 with the entry body 6.

It will be understood that the invention is not limited to terminations for pipes and may be applied to terminations for electric cables in which an outer insulation sheath covers an electrically conductive sleeve such as wire armour or braid.

It will also be appreciated by those familiar in this field that the invention has application to different types of glands for terminating cables and pipes and is not limited to the exemplary gland above-described.

Claims

1. A gland (5) for terminating cables and pipes (1) having an electrically conductive sleeve (2) covered by an outer sheath (4) of electrically insulating material characterised by an electrically conductive gland body (6) having an axial opening (10) at one end for receiving the cable or pipe (1), and an electrically conductive earthing ring (16) receivable in the opening (10) for providing an earth connection between the gland body (6) and the cable or pipe (1), the earthing ring (16) being a push fit in the opening (10) on insertion of the cable or pipe (1) and having at least one contact finger (18) for surrounding the outer sheath (4) of the cable or pipe (1) with an inwardly directed projection (19) for piercing the outer sheath (4) and contacting the sleeve (2), the contact finger (18) being arranged to extend axially and radially outwards in an undeformed free state of the earthing ring (16) prior to insertion in the opening (10) and being deflectable inwardly towards the cable or pipe (1) on insertion of the earthing ring (16) into the opening (10) by engagement with a tapered entry portion (11) of the opening (10) causing the projection (19) to pierce the outer sheath (4) and contact the sleeve (2).
2. A gland according to Claim 1 characterised in that the gland body (6) has an internal shoulder (15) for axially locating the earthing ring (16) in the opening (10).
3. A gland according to Claim 1 or Claim 2 characterised in that the earthing ring (16) has a plurality of circumferentially spaced contact fingers (18).
4. A gland according to any one of the preceding

Claims characterised in that the earthing ring (16) comprises a flat washer (17) engaged by the end of the cable or pipe (1) with the contact finger(s) (18) extending from the periphery of the washer (17).

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to cause the projection (19) to pierce the insulation (4) and contact the inner sleeve (2).

5. A gland according to any one of the preceding Claims including means (20) for sealing the outer sheath (4) of the cable or pipe (1).

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6. A gland according to Claim 5 characterised in that the sealing means (20) comprises an annular seal (20) of resilient material that is compressed inwardly to engage the outer sheath (4) by threaded engagement of a seal nut (14) with the entry body (6).

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7. A gland according to Claim 6 characterised in that the seal nut (14) is engageable with a stop (7) on the entry body (6) to control compression of the seal (20).

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8. A gland according to Claim 6 characterised in that the seal (20) is compressed by engagement with the tapered entry portion (11) of the opening (10).

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9. A gland (5) for terminating cables and pipes (1) having an electrically conductive sleeve (2) covered by an outer sheath (4) of electrically insulating material characterised by a gland body (6) having an opening (10) for receiving the cable or pipe (1), and an insulation piercing earthing ring (16) having at least one contact arm (18) arranged to surround the cable or pipe (1) within the gland body (6) for making an electrical connection between the gland body (6) and the sleeve (2), the earthing ring (16) being a push fit in the opening (10) on insertion of the cable or pipe (1), and the opening (10) having a tapered entry portion (11) for deflecting the contact arm(s) (18) towards the cable or pipe (1) to pierce the outer sheath (4) and contact the conductive sleeve (2).

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10. An insulation piercing termination for establishing an electrical connection between an electrically conductive inner sleeve (2) of an insulated pipe (1) and a gland body (6) having an opening (10) for receiving the end of the pipe (1) characterised by an insulation piercing earthing ring (16) for locating against the end of the pipe (1) with at least one contact arm (18) surrounding the pipe (1), the contact arm (18) having an inwardly directed insulation piercing projection (19), and the earthing ring (16) being a push fit in the opening (10) on insertion of the pipe (1) to contact the gland body (6) with a tapered entry portion (11) of the opening (10) co-operating with the contact arm (18) to deflect the contact arm (18) towards the pipe (1)

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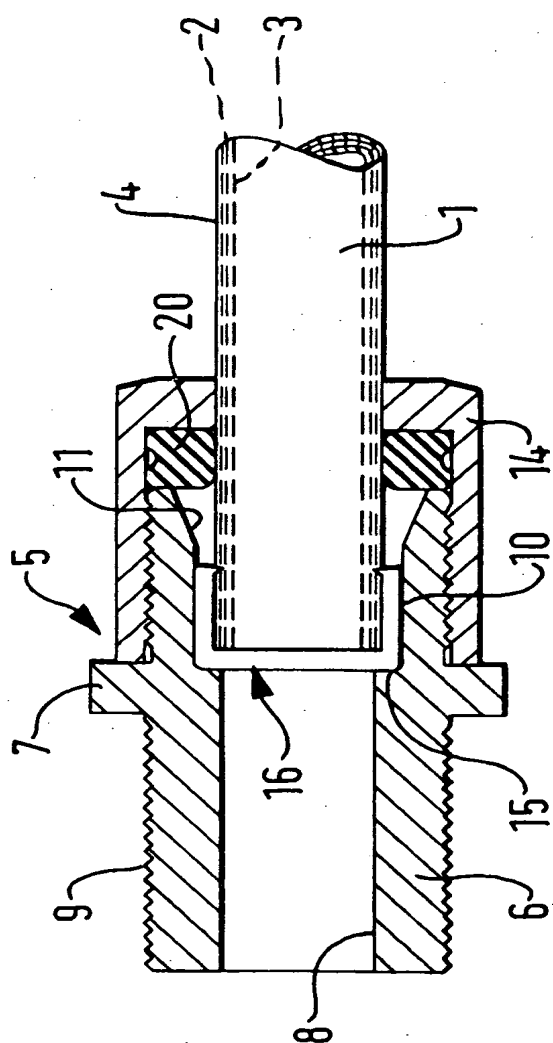


FIG. 1

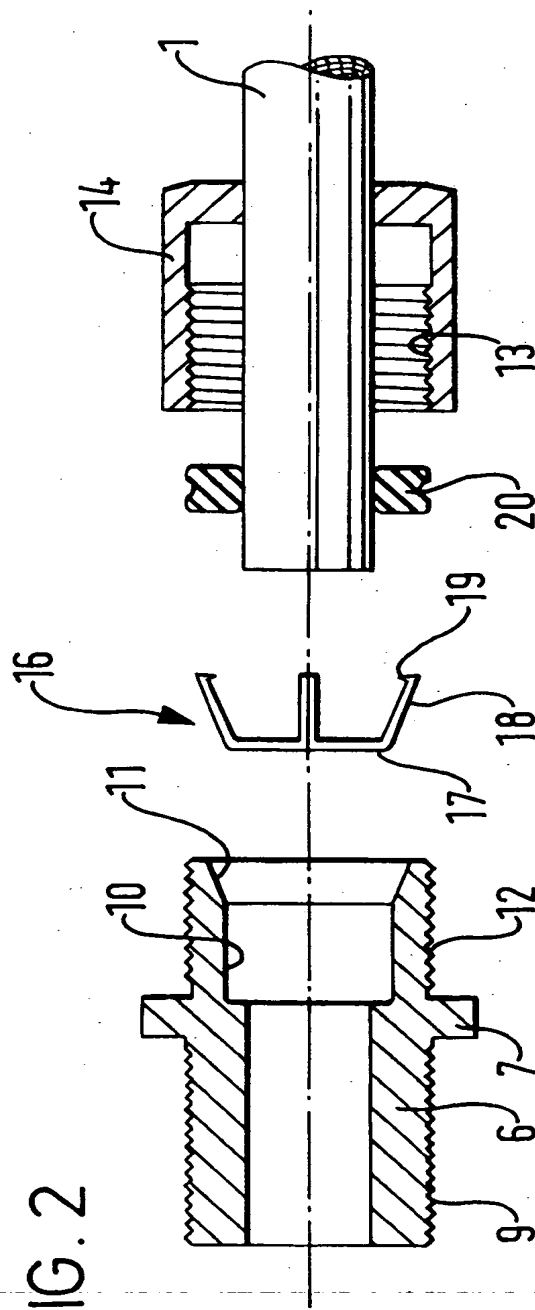


FIG. 2

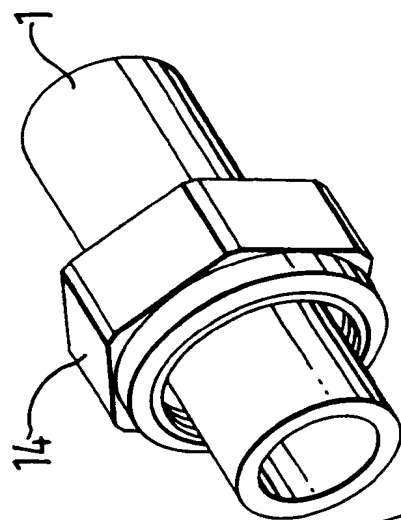
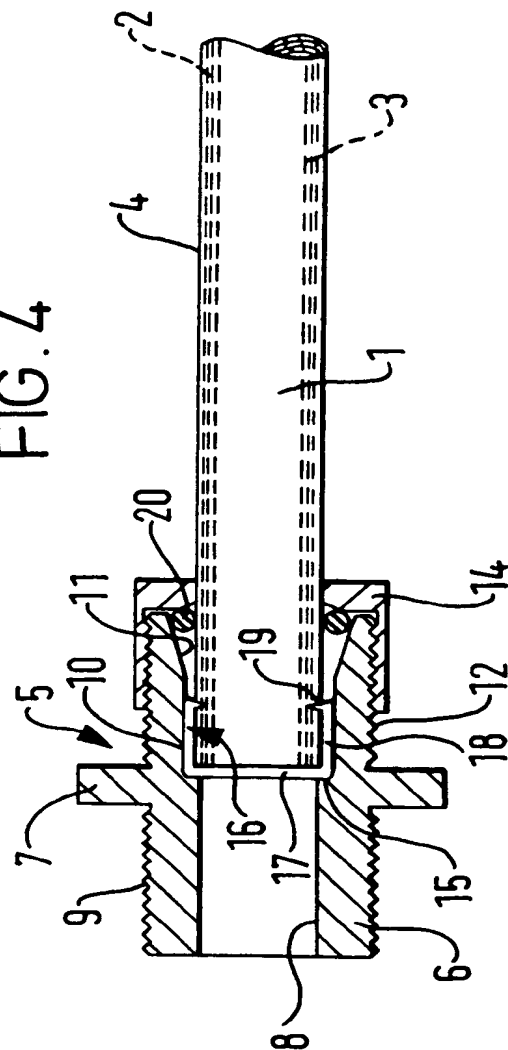
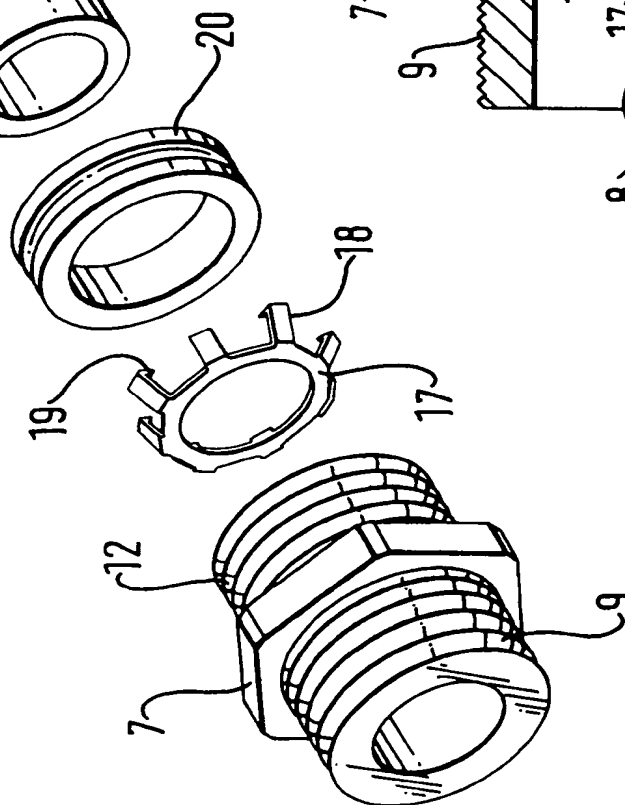


FIG. 3





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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 3253

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CL.6)
X	DE-B-16 15 624 (AMP)	1,3,4,9,10	H01R4/64 H01R4/60 F16L25/00
A	* column 2, line 54 - column 6, line 36; figures 1-5 *	2	
Y	US-A-5 066 248 (GAVER, JR. ET AL.) * column 4, line 4 - column 5, line 23; claim 1; figures 1-8 *	1,9,10	
Y	FR-A-2 672 105 (ATTAX) * claim 1; figures 1,2 *	1,9,10	
A	US-A-4 655 486 (TARNAY ET AL.) * column 4, line 32 - column 5, line 5; figures 1-5 *	1,9	
A	US-A-5 308 122 (CRAWFORD ET AL.) * claim 1; figures 1-3 *	1,7	
			TECHNICAL FIELDS SEARCHED (Int. CL.6)
			H01R H02G F16L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 30 August 1995	Examiner Lomme1, A
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : member of the same patent family, corresponding document</p>			

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